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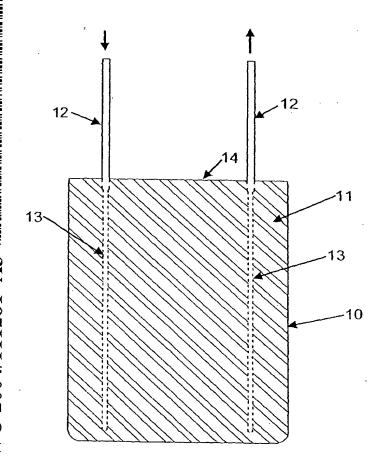
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[Continued on next page]

(54) Title: COMPACT MICRO-POROUS MEDIA DEVICE DEGASSING MOLTEN METAL



(57) Abstract: A degasser (10) for molten metal with a microporous plate (11). The microporous plate has at least one internal passageway (13) and an interface tube (12) attached to the microporous plate in flow communication with the internal passageway. In use the degasser is submerged entirely below the surface of the molten metal. Hydrogen is removed from the metal melt by diffusion of hydrogen atoms into the porous plate to form therein H2 gas. Either a vacuum or a purge of inert gas removes hydrogen gas from the microporous plate through the interface tube (12). In a preferred embodiment the microporous plate has an internal cavity in flow communication with the interface tube(s).

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as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designations AE. AG. AL. AM. AT. AU. AZ. BA. BB. BG. BR. BW. BY. BZ. CA. CH. CN. CO. CR. CU. CZ. DE. DK. DM. DZ. EC. EE. EG. ES. FI. GB. GD. GE. GH. GM. HR. HU, ID. IL, IN. IS. JP. KE. KG. KP. KR. KZ. LC. LK. LR. LS. LT. LU. LV. MA. MD. MG. MK. MN. MW. MX. MZ. NA. NI. NO. NZ. OM. PG. PH. PL. PT. RO. RU. SC. SD. SE. SG. SK. SL. SY. TJ. TM. TN. TR. TT. TZ. UA. UG. UZ. VC. VN. YU. ZA. ZM. ZW. ARIPO patent (BW. GH. GM. KE. LS. MW. MZ. NA.

SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM). European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)

- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii)) for all designations
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IPC 7	SIFICATION OF SUBJECT MATTER C22B9/05 C22B21/06 B22D1,	/00 C21C7/00	
According	to International Patent Classification (IPC) or to both national class	silication and IPC	
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	data base consulted during the International search (name of data iternal, PAJ, WPI Data	a base and, where practical, search terms used	1)
С. БОСИМ	ENTS CONSIDERED TO BE RELEVANT		
Category °	Citation of document, with indication, where appropriate, of the	relevant passages	Relevant to claim No.
X	PATENT ABSTRACTS OF JAPAN vol. 010, no. 219 (C-363), 31 July 1986 (1986-07-31) & JP 61 056257 A (JAPAN METALS LTD), 20 March 1986 (1986-03-20	& CHEM CO	1,13
Y	abstract		5,25
A	GB 2 077 890 A (MORGAN REFRACTO 23 December 1981 (1981-12-23) abstract; figure 1	1,13	
A	US 3 881 709 A (STEEN WILLIAM JO 6 May 1975 (1975-05-06) claim 1; figures 1,2	1-3	
Y	US 3 743 500 A (FOULARD J ET AL) 3 July 1973 (1973-07-03) figure 1)	25
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<u> </u>	er documents are listed in the continuation of box C.	X Patent family members are listed in	annex.
"A" documer	egories of cited documents: It defining the general state of the art which is not	"T' later document published after the inter or priority date and not in conflict with t clied to understand the principle or the	ne application but
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Date of the ac	ctual completion of the international search	Date of mailing of the international search	
11	January 2005	18/01/2005	
Name and ma	alling address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (431-70) 340-2040, Tx. 31 651 epo nt,	Authorized officer	
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INTERNATIONAL SEARCH REPORT

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		PCT/US2004/018594					
C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT Category Citation of document, with indication, where appropriate, of the relevant passages Relevant to claim No.							
ategory *	Citation of document, with indication, where appropriate, or the relevant passages	Tabby and to state of					
4	US 5 733 500 A (MESEHA GEORGE M ET AL) 31 March 1998 (1998-03-31) abstract; claim 4; figure 1	4,13,14, 16,25,26					
Υ	US 4 735 400 A (MIYAMAOTO KUNIAKI ET AL) 5 April 1988 (1988-04-05) abstract; figures 1-5	5					
	•						
		·					

INTERNATIONAL SEARCH REPORT

Inti al Application No PCI/US2004/018594

	atent document in search report		Publication date		Patent family member(s)	Publication date
JP	61056257	Α	20-03-1986	NONE		
GB	2077890	A	23-12-1981	NONE		
US	3881709	A A	06-05-1975	GB	1425034 A	18-02-1976
				ÞΕ	2333029 A1	06-12-1973
				FR	2176007 A1	26-10-1973
				IT	984271 B	20-11-1974
				NO	133039 B	17-11-1975
US	3743500	Α	03-07-1973	AT	287324 B	25-01-1971
				BE	803757 A7	18-02-1974
				CA CH	944147 A1 494821 A	26-03-1974 15-08-1970
				DE	1900191 B1	04-12-1969
				ES	362275 A1	01-11-1970
				ES	380652 A1	01-11-197
				FR	1582780 A	10-10-1969
				GB	1230553 A	05-05-197
				JP	48041404 B	06-12-1973
				NL	6902481 A ,B	19-08-1970
				NO OA	128875 B 2967 A	21-01-1974 15-12-1970
				OA SU	455548 A3	30-12-1974
				SU	555860 A3	25-04-197
us	5733500	Α	31-03-1998	US	5891215 A	06-04-1999
LLS	4735400		05-04-1988	JP	62227027 A	06-10-1987
				JP	1507054 C	13-07-1989
٠				JP	62227028 A	06-10-198
				JP	63060091 B	22-11-198
				JP	2047436 Y2	13-12-199
,				JP JP	63007793 U 63027458 U	19-01-1988 23-02-1988
				JP	63044450 Y2	18-11-198
				JP	1507057 C	13-07-1989
				JP	63011613 A	19-01-198
				JP	63060092 B	22-11-198
				JP	1029233 Y2	06-09-1989
				JP CA	63078899 U	25-05-198
				CA DE	1285762 C	09-07-199 01-10-198
				DE	3709905 A1 3744694 C2	23-11-198
				FR	2596417 A1	02-10-198
				FR	2601693 A1	22-01-198
				FR	2601694 A1	22-01-198
				FR	2601695 A1	22-01-198
				GB	2188404 A ,B	30-09-198
				GB	2219381 A ,B	06-12-1989
				GB	2219382 A ,B	06-12-1989
			•	GB	2228073 A ,B	15-08-199
				IT KR	1205991 B 9101487 B1	05-04-1989 09-03-199

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